

A New *Ecphora* Fauna from Southern Florida

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ABSTRACT

A species radiation of the extinct rapanine thaidid genus *Ecphora* Conrad, 1843 is reported from the lowermost beds of the Pliocene Buckingham Formation (= Pinecrest Beds of Olsson) at Sarasota, Florida. Five *Ecphora* species were collected together in the basal units (Units 10 and 11 of Petuch, 1982) of the Macasphalt Newburn Pit Mine, and these constitute the richest *Ecphora* fauna ever reported from one locality. Of these five species, three were previously described. *Ecphora quadricostata* (Say, 1824) and *E. parvicostata* Pilsbry, 1911, which range from Virginia to Florida, and *E. striatula* Petuch, 1986, which is confined to southern Florida. Two species, *E. bradleyae* and *E. hertweckorum*, are described as new.

INTRODUCTION

In the late 1960's, a new molluscan paleontological resource opened near Sarasota, Florida. This site, the Macasphalt Newburn Pit Mine #0800826 (formerly the "Warren Brothers Shell Pit") is dug entirely into the Pliocene Buckingham Formation (Mansfield, 1939; = Pinecrest Beds of Olsson, 1968; Petuch, 1986). This locality has proven to be one of the most important paleontological collection areas in peninsular Florida. The pit mine is unusual for Florida because of its large size and in that it is continuously pumped, preventing filling by groundwater and allowing for in-place collecting down to 70 foot depths (21 m). The remarkable richness of the Sarasota molluscan fauna far surpasses that of any other known Pliocene fauna in the eastern United States. To date, I have collected over 600 species of gastropods from the quarry, of which at least half are estimated as being new to science (Petuch, 1982).

A preliminary survey of the faunas and stratigraphy of the Macasphalt Pit Mine has shown that there are 11 fossiliferous beds or members exposed in the quarry. A stratigraphic arrangement of numbered units, starting at the top and working downward (since the quarry is being deepened), was given in my earlier paper on the Sarasota pit mine (Petuch, 1982). The upper beds (Units 1–9) contain a typical, although extremely rich, warm water Pliocene fauna that has many elements in common with the upper beds of the Yorktown Formation of Virginia and northern North Carolina, the Duplin Formation of

the Carolinas, and the upper bed of the Jackson Bluff Formation of northwestern Florida (the "Cancellaria Zone" of Mansfield, 1930). These formations have been shown to be contemporaneous (Hazel, 1983). The basal beds of the quarry (Units 10 and 11), however, contain a very different molluscan assemblage with several species of the extinct rapanine thaidid genus *Ecphora* Conrad, 1843. The fauna of these lowermost units resembles those of the lower beds of the Yorktown Formation and the "Ecphora Zone" of the Jackson Bluff Formation (Mansfield, 1930).

Unlike the northern Florida Pliocene beds, which most often contain a single, often poorly preserved, species of *Ecphora*, the basal units of the Buckingham Formation at Sarasota contain a well-preserved and richer fauna. Altogether, five species have been collected from these lower units. This is the richest single *Ecphora* fauna presently known from any formation, surpassing that of the Miocene beds of Chesapeake Bay. The five species of the Buckingham Formation may possibly represent the last *Ecphora* species radiation; the "last gasp" of a group that died out at the end of the Pliocene.

In this paper, the Sarasota *Ecphora* radiation is described for the first time, as are two new *Ecphora* species. Institutional abbreviations used here include: USNM (National Museum of Natural History, Smithsonian Institution, Washington, D.C.); MCZ (Museum of Comparative Zoology, Harvard University).

SYSTEMATICS

Family **Thaididae**

Subfamily **Rapaninae**

Genus *Ecphora* Conrad, 1843

Ecphora quadricostata (Say, 1824)
(figures 10–12)

Fusus 4-costatus Say, 1824: 127, pl. vii, fig. 5.

Fusus quadricostatus Conrad, 1830: 211.

Ecphora quadricostata Conrad, 1843: 310

Colus quadricostatus Tuomey and Holmes, 1857: 149, pl. xxx, fig. 4

Ecphora quadricostata umbilicata (Wagner) Mansfield, 1930: 70–71, pl. 17, fig. 7.

Ecphora quadricostata Olsson, 1968:73–75, pl. 1, fig. 1.

Ecphora quadricostata Wilson, 1987:23–25.

Material examined: Two specimens, lengths 30 mm and 52 mm (incomplete), Unit 11 of Macasphalt Pit Mine #0800826, Sarasota, Florida, paleontology collection of Department of Geology, Florida Atlantic University; length 29 mm, spoil pile from construction dig, Cape Coral, Lee County, Florida, MCZ 29453 (figures 11, 12); length 60 mm, Unit 11 of Macasphalt Newburn Pit Mine, Petuch collection.

Discussion: Although *Ecphora quadricostata* is common in the Yorktown and Duplin formations, it is relatively rare in southern Florida, with only one previous pictorially documented example (Olsson, 1968: pl. 1, fig. 1). The paucity of specimens of *E. quadricostata* in southern Florida may reflect paleotemperature preferences, with *E. quadricostata* having preferred the cooler water temperatures of the mid-Atlantic region and the closely-related *E. hertweckorum* new species and *E. striatula* Petuch, 1986 having preferred the tropical lagoonal and coral reef environments of peninsular Florida.

Ecphora quadricostata differs from its Floridian relatives, *E. hertweckorum* and *E. striatula*, in being stockier and heavier, with small but noticeable “T”-shaped flanges on the ribs (figure 19). Specimens examined from Virginia, North Carolina, and Florida, all had one or two grooves on each rib. These grooves, which are arranged medially, give the rib a bisected appearance. The closely-related *E. hertweckorum* lacks these grooves. Occasional specimens of *E. quadricostata* show a fifth, smaller rib around the base of the siphonal canal, but this fifth rib is never equal in size to the other ribs.

Wilson (1987) recently resolved some of the taxonomic problems revolving around *E. quadricostata*. He demonstrated unequivocally that *E. quadricostata* is a Pliocene species, typically from the Yorktown Formation, and that the Maryland Miocene species referred to this taxon by Martin (1904) was actually a new species, which he named *E. gardnrae*. Wilson also showed that the taxon *E. quadricostata umbilicata* “Wagner” (of authors), often applied to Floridian specimens of *E. quadricostata* (i.e., Mansfield, 1930), is a synonym of *E. quadricostata*.

Ecphora parvicostata Pilsbry, 1911
(figures 8, 9)

Ecphora parvicostata Pilsbry, 1911:438–439, Wilson, 1987:23

Material examined: Two specimens, lengths 92 mm and 30 mm (juvenile), Unit 11 of Macasphalt Pit Mine #0800826, Sarasota, Florida, MCZ 29452; length 101 mm (figured here), same locality, Petuch collection.

Discussion: *Ecphora parvicostata* has the most inflated shell and least developed ribs of the known Floridian *Ecphora* species. In cross section (figure 16), the ribs are rounded in shape and are adherent to the body whorl. As in *E. quadricostata*, the ribs of *E. parvicostata* also

are marked with a medial groove, giving the rib a bisected appearance. Unlike *E. quadricostata*, *E. parvicostata* is an intricately sculptured species when young, becoming smoother and less sculptured as it matures. The 30 mm juvenile specimen listed above (MCZ 29452) has numerous large spiral cords and intermittent pitlike depressions between the ribs. The shoulder of the juvenile *E. parvicostata* is also distinctly rounded. Conversely, the 29 mm juvenile *E. quadricostata* listed previously (MCZ 29453) is smooth between the ribs, as in adults, and has an angled shoulder.

The biogeographic and stratigraphic ranges of *E. parvicostata* are still in debate, as the type locality given by Pilsbry (1911) appears to be in error. The three specimens in Pilsbry’s type lot were mixed in with specimens of *E. tricostata* Martin, 1904, and since that species is only known from the Miocene, and mostly from Maryland, Pilsbry assumed that his *E. parvicostata* was also from the Chesapeake Miocene. Since the collector was unknown, no more information about the type locality could be gathered. Subsequent extensive collecting in the Miocene formations of Maryland (Calvert, Choptank, Little Cove Point Unit, and St. Mary’s), Virginia (Eastover) (Ward and Blackwelder, 1980), and North Carolina (Pungo River), have failed to uncover any large *Ecphora* species that even remotely resemble *E. parvicostata*.

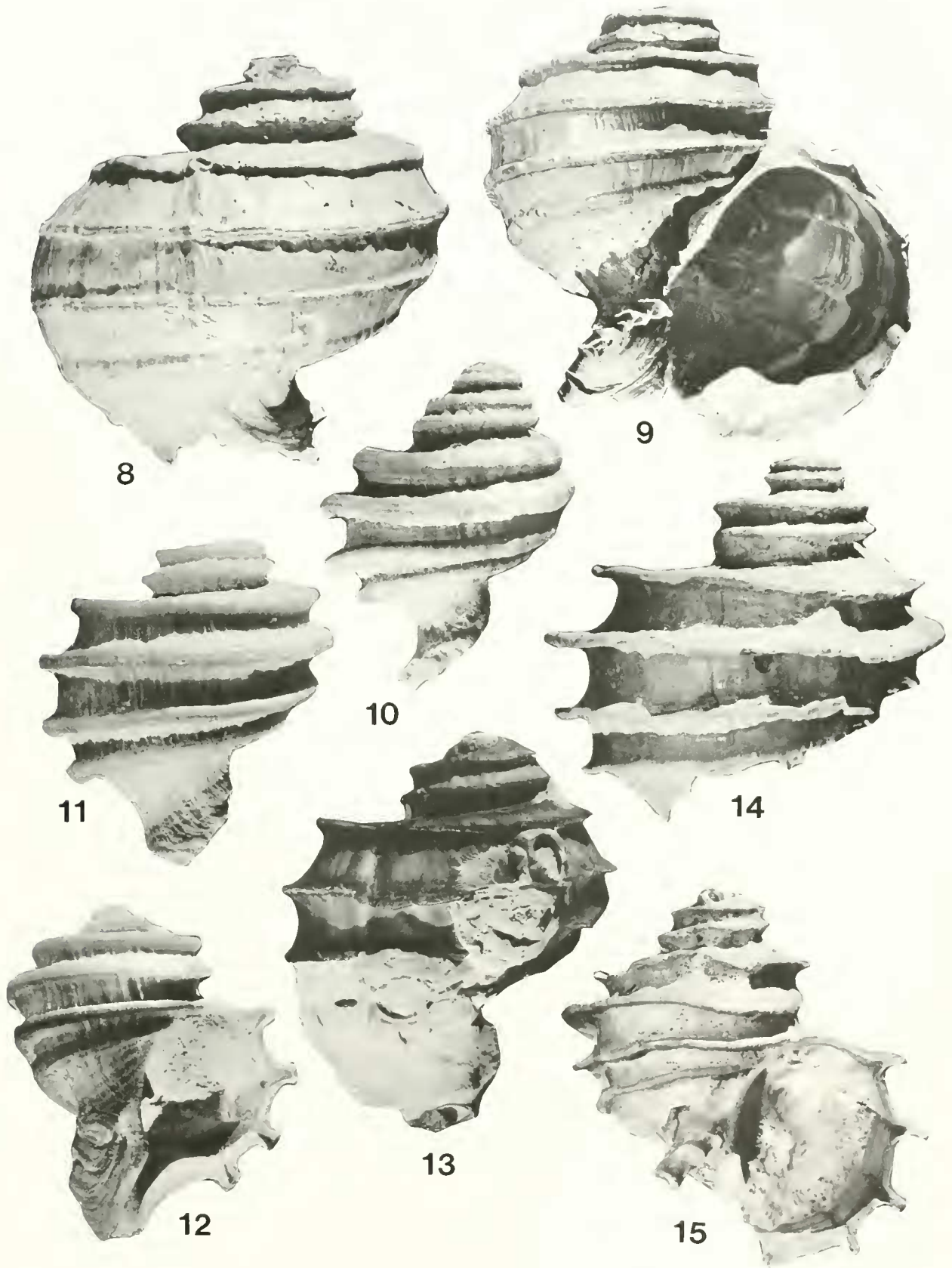
The finding of three specimens of *E. parvicostata* in the Buckingham Formation at Sarasota documents the species as being Pliocene in age. Dr. Emily Vokes (personal communication) told me of two specimens of *E. parvicostata* in the Tulane University paleontology collections, one from the Yorktown Formation at Riee’s Pit and the other from the Jackson Bluff Formation of northern Florida. These two specimens further support a Pliocene age for the species. Wilson (1987) also stated that *E. parvicostata* “must come from Virginia”, but considers it “only an extreme variation of *E. quadricostata*”. Considering the great differences in the juvenile shells of *E. quadricostata* and *E. parvicostata* and the larger size and more inflated body whorl of the adult *E. parvicostata*, I believe that the two species are distinct, albeit closely related. All three Sarasota specimens of *E. parvicostata* differ from Pilsbry’s type in having five ribs instead of four, but are otherwise identical in form.

Ecphora striatula Petuch, 1986
(figure 13)

Ecphora striatula Petuch, 1986:406, pl. 3, figs. 15, 16.

Material examined: Holotype, length 31 mm, Unit 10 of Macasphalt Pit Mine #0800826, Sarasota, Florida, MCZ 29225; paratype (fragment of spire), length 11 mm, “Lakes of the Meadows” subdivision, Bird Road, western Metropolitan Miami, Dade County, Florida, from 20 m depth dredge site, MCZ 29235; length 70 mm, encased in limestone, from boulder along Tamiami Trail near Ochopee, Collier County, Florida, Petuch collection, illustrated here.





Discussion: Morphologically, the closest species to *Ecphora striatula* is *E. hertweckorum*. The differences between the two species are discussed under *E. hertweckorum*. Although contemporaneous with *E. hertweckorum*, *E. striatula* appears to have had different ecological preferences, and the two species have not been collected together. At Bird Road in Miami, *E. striatula* (fragmentary paratype) was collected along with massive reef corals and a large fauna of coral reef-associated mollusks (Petuch, 1986). The Tamiami Trail specimen was found encased in a block of reefal limestone, also indicating that *E. striatula* inhabited coral reefs.

The holotype of *E. striatula* from Sarasota, although not found along with massive reef corals, was collected in a dense biohermal assemblage of the interlocking branching coral *Septastraea crassa* (Holmes, 1858) in the Macasphalt Pit. *Ecphora hertweckorum*, on the other hand, appears to have been a lagoonal, soft substrate species, and is usually found together with the large lagoonal bivalves *Chesapeake septenarius* (Say, 1824) and *Carolinapecten eboreus* (Conrad, 1833). *Ecphora striatula* can be considered an index fossil for the fossil reefs and bioherms of the oval-shaped "Everglades Pseudotoll" (Petuch, 1986, 1987).

Ecphora bradleyae new species
(figures 1-6)

Material examined: HOLOTYPE—length 66 mm, Unit 10 of Macasphalt Newburn Pit Mine #0800826, Sarasota, Florida, USNM 358548; PARATYPES—length 33 mm, same locality as holotype, MCZ 29447; length 76 mm, same locality as holotype, MCZ 29449; fragment, 95 mm, same locality as holotype, MCZ 29450; 3 specimens, lengths 85-105 mm, same locality as holotype, Petuch collection.

Description: Shell turbate in form, thickened, with 4 wide, flattened spiral ribs on body whorl; ribs strongly "T"-shaped in cross section (figure 20); some specimens with ribs almost touching along edges; ribs ornamented with 4-8 fine, incised grooves; shell smooth and unornamented between and beneath grooves; shoulders rounded; spire elevated, with sloping outline; columella adherent; umbilicus open, flaring; siphonal canal well developed; aperture moderate in size for genus, round in shape; spire whorls with 2 ribs per whorl; suture and

edge of shoulder rib separated by wide space, giving spire tabulate appearance; calcitic outer shell layer colored cream-tan or reddish-gray.

Range: Known only from Unit 10 of the Macasphalt Newburn Pit Mine #0800826, Sarasota, Florida. Buckingham Formation, early Pliocene.

Etymology: Named for Mrs. Evelyn Bradley, of Bradenton, Florida, who collected the holotype.

Discussion: *Ecphora bradleyae* differs from the other known members of the genus in having extremely well developed "T"-shaped ribs, and in having a more rounded, fusiform outline. The flanges of the "T"-shaped ribs of some specimens almost coalesce (such as in the paratype shown here in figure 7), in effect producing a double shell. This may have been an anti-crab predation adaptation; doubling the effective shell thickness without doubling the shell weight, and therefore, making it more difficult for peeling crabs, such as *Menippe*, to break back the outer lip. The small paratype (figures 3, 4) has a large healed break that probably resulted from an unsuccessful crab attack.

Ecphora hertweckorum new species
(figures 14, 15)

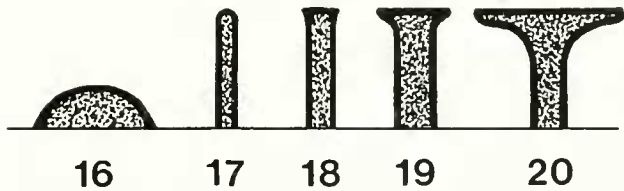
Material examined: HOLOTYPE—length 50 mm (missing siphonal canal), Unit 11, Macasphalt Pit Mine #0800826, Sarasota, Florida, MCZ 29448; PARATYPES—3 fragmentary specimens, lengths 35-47 mm, same locality as holotype, MCZ 29451; length 90 mm (fragmentary), same locality as holotype, Petuch collection.

Description: Shell inflated, thin, delicate; body whorl with 4 very thin, greatly-projecting, bladelike spiral ribs; ribs (figure 17) rounded along edges without "T"-shaped flange; shoulder sharply angled; spire elevated, scalariform; spire whorls with 2 ribs per whorl; shell smooth between ribs, without sculpturing; umbilicus wide, flaring; calcitic outer shell layer colored cream to yellowish-tan.

Range: Known only from Unit 11 in the Macasphalt Newburn Pit Mine #0800826, Sarasota, Florida. Buckingham Formation, early Pliocene. The fragment illustrated by Olsson and Petit, 1964 (as "*Ecphora quadri-*

Figures 1-7. *Ecphora bradleyae* new species, from Unit 10 in the Macasphalt Newburn Pit Mine, Sarasota, Florida. 1, 2. Holotype, 66 mm, USNM 358548. 3, 4. Paratype, 33 mm, MCZ 29447. 5, 6. Paratype, 105 mm, Petuch collection. 7. Paratype, 76 mm, MCZ 29449

Figures 8-15. 8, 9. *Ecphora parvicostata* Pilsbry, 1911, 92 mm, Macasphalt Newburn Pit Mine, Unit 11. 10. *Ecphora quadricostata* (Say, 1824), 30 mm (broken), Macasphalt Newburn Pit Mine, Unit 11. 11, 12. *Ecphora quadricostata* (Say, 1824), 29 mm, Cape Coral, Lee Co., Florida, MCZ 29453. 13. *Ecphora striatula* Petuch, 1986, 70 mm (partially covered with limestone and barnacles), along Tamiami Trail near Ochopee, Collier Co., Florida. 14, 15. *Ecphora hertweckorum* new species, holotype, 50 mm (incomplete), Macasphalt Newburn Pit Mine, Unit 11, MCZ 29448.



Figures 16–20. Cross sections of the ribs of Floridian *Ecphora* species. 16. *Ecphora parvicostata* Pilsbry, 1911. 17. *Ecphora hertweckorum* new species. 18. *Ecphora striatula* Petuch, 1986. 19. *Ecphora quadricostata* (Say, 1824). 20. *Ecphora bradleyae* new species.

costata umbilicata Wagner”, pl. 82, fig. 7), from Pinecrest, Collier County, Florida, may be this species.

Etymology: Named for Mr. and Mrs. Charles (and Violet) Hertweck of Venice, Florida, in recognition of their extensive fossil collecting around southern Florida, which has resulted in the discovery of many new species.

Discussion: *Ecphora hertweckorum* is most similar to the contemporaneous *E. striatula* Petuch, 1986 (figure 13). That species, however, differs in being more inflated, ovate, and lower spired, in being heavily sculptured with numerous raised threads between the ribs and on the siphonal canal, and in having flattened edges on the ribs. *Ecphora hertweckorum* is characteristically unornamented with no sculpturing between the ribs or on the siphonal canal, and has rounded edges on the ribs. The spire of *E. hertweckorum* is also more elevated than that of *E. striatula*, and has an obvious stepped appearance.

From the ubiquitous *E. quadricostata* (figures 11, 12), *E. hertweckorum* differs in being a much thinner, much more inflated shell with more prominent, bladelike ribs. Besides being thinner and more fragile, the ribs of *E. hertweckorum* lack the obvious “T”-shaped flanges seen on the ribs of *E. quadricostata*. *Ecphora hertweckorum* is very similar both in shell shape and in the structure of the ribs, to the un-named species from the Miocene Choptank Formation of Maryland that was illustrated by Martin (1904: pl. LII, fig. 4). Although Martin referred the Choptank species to the taxon “*Ecphora quadricostata* var. *umbilicata* (Wagner)”, Wilson (1987) has shown that that name is referable to the Pliocene *E. quadricostata*, leaving the Choptank species nameless. The thin-ribbed Choptank species, which Martin described as having ribs that were not “T”-shaped and as being thinner than typical *E. quadricostata* (and presumably *E. gardnerae*), may be the direct ancestor of *E. hertweckorum*. If that is the case, then there may be separate evolutionary lineages for both the thin-ribbed species and those with “T”-shaped ribs.

KEY TO THE FLORIDIAN ECPHORA SPECIES

The shape, size, arrangement, and degree of development (projecting from the body whorl) of the ribs on *Ecphora* species are consistent and important taxonomic

characters. The rib shape is best seen in cross section (figures 16–20) or in profile at the edge of the aperture. On a few species, secondary sculpturing on the body whorl between the ribs is also an important taxonomic character. See Wilson (1987) for a review of the genus.

- 1a. Ribs depressed, adherent, cordlike, rounded (figure 16) *E. parvicostata*
- 1b. Ribs elevated, projecting from body whorl (figures 17–20) 2
- 2a. Ribs very thin, bladelike, with rounded edges (figure 17); body whorl smooth ... *E. hertweckorum*
- 2b. Ribs very thin, bladelike, with squared edges (figure 18); body whorl sculptured with spiral threads *E. striatula*
- 2c. Ribs with laterally-expanded terminal flanges (figures 19, 20) 3
- 3a. Ribs with slightly-developed terminal flanges; slightly “T”-shaped in cross section (figure 19) *E. quadricostata*
- 3b. Ribs with greatly-developed, broad terminal flanges; distinctly “T”-shaped in cross section (figure 20) *E. bradleyae*

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